THE extraction of the perfume from flowers such as jasmine, tuberose, violet and cassia has long been carried out by the process of enfleurage, the blossoms being left in contact with purified lard for a few days, and then replaced by fresh blossoms. The lard is either sold as such, or the essential oil may be extracted from it by melting it under strong alcohol. As the process of enfleurage is somewhat tedious, attempts have frequently been made to extract the oil directly from the flowers by means of light petroleum, but these processes have not as a rule proved successful, and it has recently been found that a very large proportion of the perfume is actually produced for the first time in the blossoms during the time occupied by the enfleurage. An interesting illustration of this is given by Dr. Albert Hesse in a recent number of the *Berichte*, in which he states that a ton (1000 kilos.) of tuberose blossoms only yielded 66 grams of oil when extracted with light petroleum, but during enfleurage yielded 801 grams of oil to the fat in which they were embedded, whilst a further 78 grams remained in the faded blossoms and could be separated by extraction or distillation. It thus appears that eleven times as much perfume is produced during enfleurage as is originally present in the flowers, and that even after enfleurage the exhausted flowers contain more perfume than when first gathered.

THE additions to the Zoological Society's Gardens during the past week include a Macaque Monkey (*Macacus cynomolgus*) from India, presented by Captain Lambert Larking; a Naked-footed Owlet (*Athene noctua*) from Holland, presented by Mr. R. Souper; a Common Cormorant (*Phalacrocorax carbo*), British, presented by Mr. C. F. McNiven; a Nilotic Trionyx (*Trionyx niloticus*) from West Africa, presented by Mr. Henry Reeve; a Common Chameleon (*Chamoeleon vulgaris*) from North Africa, presented by Mr. M. J. Comyn; three Suricates (*Suricata tetradactyla*) from South Africa, ten Black-spotted Lizards (*Algiroides nigro-punctatus*) from Madeira, deposited; a Thar (*Hemitragus jemlaica*), a Burrhel Wild Sheep (*Ovis burrhel*), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES IN JUNE:—

June 3.	Predicted perihelion passage of Faye's comet.
,,	15h. Mars in conjunction with moon. Mars 1° 49′ N.
8.	12h. 10m. Minimum of Algol (β Persei).
15.	Venus. Illuminated portion of disc = 0·613, of Mars = 0·885.
,,	11h. Uranus in opposition to the Sun.
17.	Juno 1° N. of μ Serpentis (mag. 3·6).
,,	14h. Jupiter in conjunction with the moon. Jupiter 3° 7′ S.
19.	11h. 31m. to 14h. 55m. Transit of Jupiter's Sat. IV. (Callisto).
20.	12h. 52m. Transit (egress) of Jupiter's Sat. III. (Ganymede).
22.	3. Sun Enters Gemini. Summer commences.
27	9h. 28m. to 10h. 5m. Moon occults α Cancri (mag. 4·3).
,,	13h. 36m. to 16h. 46m. Transit of Jupiter's Sat. III. (Ganymede).
,,	16h. Mercury at greatest elongation 22° 5′ W.

VARIABILITY OF NOVA GEMINORUM.—A note from Prof. E. C. Pickering which appears in No. 3868 of the *Astronomische Nachrichten* states that the light of Nova Geminorum appears to be fluctuating in a manner similar to that of Nova Persei, No. 2. During the twenty-four hours preceding the evening of May 1, it had increased by half a magnitude.

The nature and amount of these fluctuations will be seen from the following table of measures made at Harvard:—

Date.	Magnitude.	Date.	Magnitude.
April 24	9·37	April 29	9 61
,, 25	9·67	,, 30	9·76
,, 27	9·71	May 1	9·26
,, 28	9·81		

ORIGIN OF THE H AND K LINES OF THE SOLAR SPECTRUM.—In a paper communicated to the April number of the *American Journal of Science*, Prof. J. Trowbridge, of Harvard University, gives the results he has obtained from a series of careful experiments which he made in order to determine the constitution of the H and K lines in the solar spectrum, and also discusses the nature of reversed lines in gaseous spectra.

By a series of preliminary experiments he arrived at the conclusion that the lines which he obtained coincident with the calcium lines were not due to any calcium in the glass tubes or the terminals used in obtaining the spark, and further he argues that, even if the glass did contain calcium, the duration of the spark was not sufficiently long to raise the temperature of the glass high enough for it to produce a spectrum, whilst in obtaining his spectra he photographed a part of the spark which was far enough removed from the terminals to ensure the absence of metallic particles ejected by them.

Using quartz tubes sealed by metallic ends he obtained the reversed line at λ 4227, and also lines coincident with the solar lines 3968 and 3933, quite as strong as when a glass tube was used, whilst the other strong calcium lines towards the ultra-violet were conspicuously absent.

Prof. Trowbridge found that the spectra obtained from a highly disruptive spark discharge between electrodes of some metals do not show these lines, whilst those obtained from a similar spark between other metals, *e.g.* pure silver, platinum and iridium, do show them; he suggests that in the former case the metals are easily volatilised, and their vapours conduct the spark, whereas in the case of the latter class of metals the air conducts the discharge because no metallic vapours are produced, and therefore it is some gaseous constituent of the atmosphere which produces the lines in question. For similar reasons he believes that some lines at present attributed to silicon—another highly refractive substance—are possibly atmospheric.

From these observations Prof. Trowbridge arrives at the following conclusions:—"At the basis of the great H.H lines of the solar spectrum there are strong gaseous lines which I believe to be oxygen lines. The reversed lines which apparently coincide with certain calcium lines are not due to calcium but are gaseous." Reproductions of four spectrograms, which accompany the article, illustrate the reasons for these conclusions.

THE LEEDS ASTRONOMICAL SOCIETY.—The tenth annual issue of the *Journal and Transactions* of this Society contains a series of useful papers which were communicated to the Society by its members during 1902. Amongst others there are papers on "Parallax," "Velocities, Paths and Eclipses in the Solar System" (illustrated by diagrams of the various orbits), "The Age of the Earth," "Brightness and Definition," and "The Year's Observations" (which were in the most part observations of Jovian phenomena), all of which should prove of value and interest to amateur astronomers.

The *Journal* concludes with a collection of the papers and letters communicated to other journals by the members of this Society during 1902.

THE ADVANCEMENT OF PHOTOGRAPHY.

AT the recent meeting of the Royal Photographic Society held to celebrate its jubilee, the president, Sir William Abney, K.C.B., F.R.S., suggested, in an address of which an abridgment is given below, that the Society should further mark the close of the first fifty years of its existence by establishing laboratories and suitable accommodation for the carrying out of photographic researches. A donation of 100*l.* has already been promised, on condition that 900*l.* more is raised for this purpose. The establishment of such facilities is highly desirable, for, excluding the work of a few whose names may be counted on the fingers of one

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hand, and that done by our manufacturers, which has, so far, succeeded in keeping them in the van of progress, investigations into the underlying facts of photography may be said to be non-existent in this country. A thousand pounds is a very modest sum to ask for, though no doubt it will serve to make a beginning. We hope that before very long this sum will be multiplied many times over, and that the science of photography will begin to take its proper place, instead of being regarded, as it is too often at present, as a very minor detail of a considerable industry, and an empirical art. The following remarks are from Sir William Abney's address:—

Looking back to the first day of this Society's existence, one is forcibly reminded of the advances that have been made, not only in the science, but in the art of photography, but these advances I think might have been more rapid. A very brief comparison of the processes existing now and fifty years ago will show what I mean. Paper processes, founded on the original process of Fox Talbot, were well to the fore fifty years ago, although in 1851 Scott Archer had shown to the world the practicability of taking photographs on glass by means of collodion. In that same year, when the First International Exhibition was held, calotype, Daguerreotype, and collodion processes were all worked commercially, and photographs of the interior of the Palace by all three processes are in being to-day.

At the present time it may be said that for all practical purposes the gelatine process for taking negatives has complete possession of the field, and ousted all processes which have led up to it. Negatives fifty years ago were impressions only given by the violet and blue rays existing in white light, and the resulting prints are such as would be seen by a person colour blind to the red and the green, whilst now it is not uncommon for the photograph to be made to coincide with visual impression of an ordinary eye.

There seems but little doubt that the photographic image remains of the same nature now as it was then, and whatever may have been the action of light then, so it is now, but the necessary exposure to obtain a properly developable image was at least sixty-fold more than is required for our present process, even when the collodion process was employed, where every condition remained the same except the sensitive surfaces themselves. With the Daguerreotype process perhaps we should have required ten times more than for the collodion, though we know of instantaneous work being done even with that process. For open air portraiture, the early Daguerreotypist required half an hour in bright sunshine, whilst the modern amateur will be content with a second or a fraction of a second in the same circumstances. A question one naturally asks is, What causes the difference? So far as I am aware, this question has not been fully answered, and yet it might have been had serious experiment been undertaken regarding it.

From a theoretical standpoint there are three things that have to be taken into account:—1st, the sensitiveness of the silver salt itself; 2nd, the mediums in which it is placed; and 3rd, the means of development. We have some clue to the last two. Beginning with the last first, those who practised Talbotype or the wet collodion processes know that in both of them the developing solution was an acid solution reduced from nitrate of silver, which was on the surface of the plate or paper, to the metallic state, and that there was some attractive force which caused the metallic silver to adhere to and crystallise on particles of sensitive salt which had been acted upon by light. In the gelatine process we know that development is with alkaline solution, and that the image is built up from the very molecules themselves that have been acted upon, the sensitive salt itself being reduced to metallic silver. Why should development be effected more easily in the one case than in the other? In the case of the acid development the distance of the particles of reduced silver from the molecules altered by light are far greater than they are when the material of the plate is attacked, and consequently a smaller attractive force, due to fewer molecules being altered in the latter case, is efficacious in producing a silver image than in the first case where the depositing silver has a considerable distance into which the attractive force has to be exercised. This might be an explanation. Or, again, it may be shown that a gelatine film, being a kind of filter to the developing solution, acts as a regulator in allowing the active alkaline solution to reach the particles of silver salt, and that this regulated supply would attack the molecules on which light had done part of the work of decomposition, and reached the remaining part most readily to be finished and so on, and that very little external retarding influence was necessary. But now, what is to be said regarding the increased instability of the sensitive salt? This is a question not yet investigated, but it is from such an investigation that increased rapidity is to be looked for.

But it is one thing to say what proof is required, and it is another to have the opportunity of making such proofs, and I should urge that it is part of the duty and functions of the Royal Photographic Society to lead the way in placing such means at the disposal of its members and others as will enable any of them who have the capacity to experiment in this and in any other directions which will lead to a theoretical knowledge of the action of light. It must not be forgotten that there are a great many more men with minds trained to scientific research now than formerly. There are plenty of would-be capable workers who cannot afford a laboratory of their own, and what I should wish to see in this our jubilee year is the commencement of the formation of a research laboratory adapted to the needs of the scientific workers.

One branch of photographic science is the optical, and in it we have an example of what laboratory and experimental research can do when workers are trained in scientific methods. Not many years ago the optician was challenged to increase rapidity of exposure by increased rapidity of lens. Nobly and rapidly he has responded; the advent of Jena glass enabled him to comply with the demand, and we have been getting definition of image with ratio of aperture to focal length which would have been deemed impossible not very many years ago.

I do not believe a laboratory would be an expensive matter to start. What I do advocate is to have all essentials of all instruments of first-class workmanship, and to leave the adaptation of any instrument from one special work to that of another to the worker. Hence, if my views are carried out, the initial expenses will not be so great as might be supposed. Space is the foundation of all research in photography, and that is what the Royal Photographic Society can supply, and then comes the provision of the apparatus necessary to use in such space.

I have heard that one generous man will give 100*l.* to the laboratory if 900*l.* more are raised. The 1000*l.* would go a very long way towards what we want to start with, and I hope the members of the Society will resolve to give substantial help in raising this 900*l.* The jubilee of the Society should be marked by some important piece of work, and no bigger one and more requisite is, to my mind, to be found than starting such a help to the advancement of photography.

RADIO-ACTIVE GAS FROM TAP-WATER.[1]

WHEN Cambridge tap-water is boiled the air given off is mixed with a radio-active gas. The existence of this gas is easily demonstrated by electrical means, for if the air expelled by prolonged boiling from about 10 litres of water is introduced into a closed vessel the volume of which is about 600 c.c., the amount of ionisation in the vessel (as measured by the saturation current) is increased five or six times. When the water has once been well boiled the gas expelled on any subsequent re-boiling is not appreciably radio-active. The gas can also be extracted from water at the temperature of the room by vigorously bubbling air through it; the air as it bubbles through the water gets mixed with the radio-active gas and carries it along with it. When water which has been treated in this way is boiled, no radio-active gas is given out, nor is the gas given off when air is bubbled through water which has been well boiled.

The gas extracted in this way from the water retains its

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[1] Paper read before the Cambridge Philosophical Society on May 4 by Prof. Thomson, F.R.S.

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